XV International Conference on Durability of Building Materials and Components
DBMC 2020, Barcelona
C. Serrat, J.R. Casas and V. Gibert (Eds)

Large Scale Laboratory and Field Tests of Aerogel Renders

Jürgen Frick, Nayara R. M. Sakiyama, Marina Stipetic and Harald Garrecht

Materials Testing Institute (MPA), University of Stuttgart, Pfaffenwaldring 2b, 70569 Stuttgart, Germany, juergen.frick@mpa.uni-stuttgart.de

Keywords: *Aerogel, External Insulation.*

1 Introduction

Within the framework of the European project Wall-ACE (www.wall-ace.eu) a large-scale laboratory test (EOTA-Wall Test) was performed (Figure 1). Additional a test field in Switzerland was equipped with six different aerogel renders by the project partner AGITEC (Figure 2). Laboratory walls and test field were equipped with sensors to monitor in real-time climate, heat flux, temperature, relative humidity, and at the laboratory tests additional material moisture. The data allow calculating U-values and material parameters as well as drying behaviour of render and substrate. During and after the artificial weathering in laboratory the renders were subjected to visual inspection and mechanical adhesion tests.

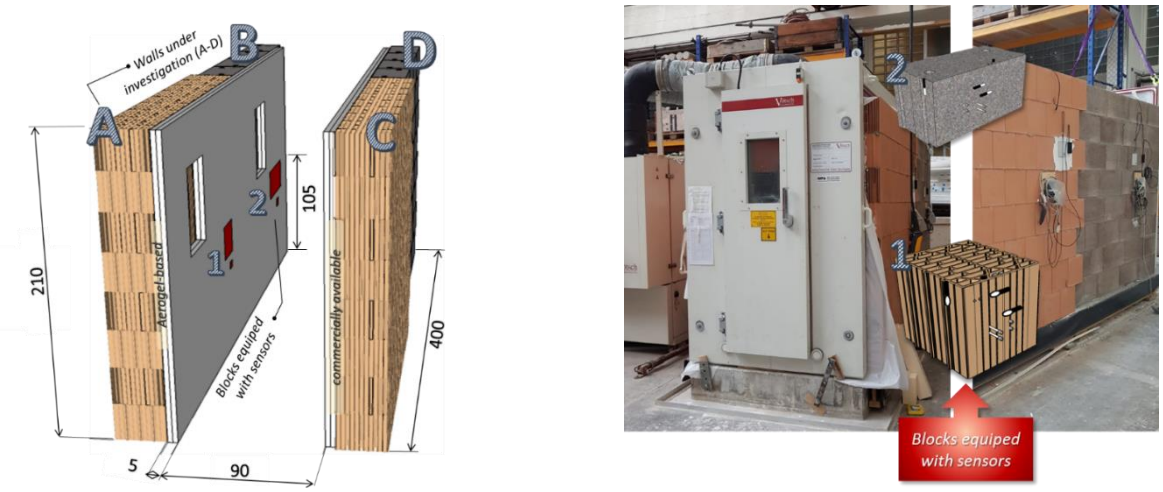

Figure 1. EOTA test rig and monitoring system. Walls A, B: Aerogel render. Walls C, D: Perlite-based render.

2 Results and Discussion

2.1 EOTA-Wall Test

The large-scale test walls were exposed to weathering cycles according to (EN 16383:2016), which are grouped into heat-rain, heat-cold and heat-rain-cold cycles. After certain weathering cycles the plasters showed a moisture uptake in the impedance measurements. Such behaviour should be omitted in the final product development due to the risk of frost cracking.

Results of adhesive strength of aerogel-based exterior insulation render was 33-60% lower after ageing compared to initial adhesive strength. These values (strength after ageing) are

comparable with adhesive strength of a commercial perlite-based render after ageing. The failure was 100% in the insulation render in all tests.

2.2 Test Field

The installation of the second Quick-Mix aerogel render was finished in mid-August 2019. The sensors in the render layer allow to follow the drying process of the material. By mid-September 2019 it was clear that the material is still damp. A U-value estimation is foreseen after winter.

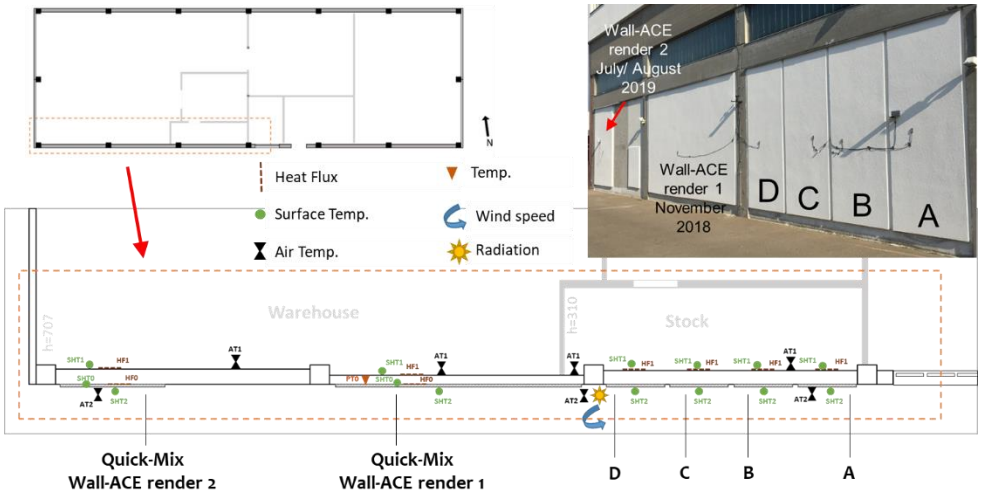

Figure 2. Floor plan: AGITEC storehouse. Feature test walls, sensors and installation.

3 Conclusions

The large scale EOTA-Test, originally developed for ETICS systems, is a valuable method to assess new developed insulation render systems. It provides a harsh environment and acts therefore as acceleration benchmark (Frick *et al.*, 2016).

The field tests serve as benchmark in real conditions. The installation at the south side results in harsher conditions with higher temperature gradients. On the other side the estimation on energy performance parameters like U-values will be more difficult. Certain methodologies will be tested with the monitoring data from the upcoming winter season (Nocentini *et al.*, 2018).

Acknowledgements

The research project Wall-ACE has received funding from the EU Horizon 2020 research and innovation programme under the Grant Agreement No. 723574.

ORCID

Jürgen Frick: https://orcid.org/0000-0002-2010-4830

References

Frick, J., Reichert, M., Lehmann, F., Stegmaier, M. and Herter, K. (2016). *Moisture Monitoring during an Artificial Weathering Test of a Cultural Heritage Compatible Insulation Plaster*. In *Proceedings of the 19th World Conference on Non-Destructive Testing*, Munich, Germany, paper Mo2C3, 1-7.

Nocentini, K., Achard, P. and Biwolé, P. (2018). *Thermal performances of an innovative super-insulating material based on silica aerogel*. In *Proceedings of 13th Conf. on Advanced Building Skins*, Bern, Switzerland, 519-529.